

# Math 124 Midterm 2 Autumn 2005

Name:

1. There are four questions in all. Answer all four. The test ends on page 5.
2. Read the questions carefully.
3. Show all your work to get full credit.
4. There is one blank sheet at the end that you can tear out and use for scratch work.
5. You may use a scientific calculator. No notes or graphing calculators are allowed.
6. Remember to label all graphs and write units.

Problem #1	Problem #2	Problem #3	Problem #4	Total Points

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**Problem 1.**(10 points) A 12 foot ladder is leaning against a wall, and the bottom of the ladder is sliding away from the wall at a rate of 3 ft/sec. Meanwhile a firefighter is climbing up the ladder at a rate of 2 ft/sec. The firefighter is 6 feet from the bottom of the ladder when the ladder makes an angle of  $\pi/3$  with the ground. Find the rate of change of the height of the firefighter above the ground at the time when the angle is  $\pi/3$ . (Be careful to give units, draw a clear picture and show all your work.)

**Problem 2.** (10 points) The volume of a sphere of radius  $r$  is  $\frac{4}{3}\pi r^3$ . Using the methods of Section 3.11, approximate the amount of paint needed to apply a coat of paint 0.05cm thick to a hemispherical dome of diameter 25 meters. (Recall that 1 meter is 100 cm.)

**Problem 3.** (10 points) Calculate  $\frac{dy}{dx}$  in each of the following cases.

(a)  $\sqrt{y} \cos y = e^{2x}$ .

(b)  $y = 2^{3^{\log_2(x)}}$  (do this using chain rule and not logarithmic differentiation)

**Problem 4.** (10 points) You are planning a 20 mile hike in the Cascades. The guidebook provides a chart, plotting elevation above the trail head (in feet) as a function of the distance hiked (in miles). The elevation is given by  $e(x) = 125x^2 - 6.25x^3$ .

(a) Find the instantaneous rate of change of elevation as a function of  $x$ .

(b) Is the hike harder at the point when you have traveled 5 miles or at 10 miles? Justify your answer.

(c) Assume that there is no flat stretch of trail either on the way up or down. Determine how far you would have traveled when you reach the highest point on the trail.

(d) What is the elevation at the highest point of the trail?